REMARKS

This is a response to the Office Action issued on August 17, 2006. In that Office Action, the Examiner rejected claims 1-7, 10-11 and 14-18 under 35 U.S.C. § 103(a) as being obvious over WO 00/23533 to *Murase* in view of United States Patent No. 5,719,205 to *Yoshihara*. Claims 2 and 13 were rejected under 35 U.S.C. § 102(b) as being anticipated by the '533 *Murase* reference. Claims 8, 9, and 19-20 were rejected under § 103 as being obvious over *Murase* in view of *Yoshihara* and in further view of European Patent Application No. 1 114 734 A1 to *Sumita et al.*

Claim 12 has been amended, and new claims 21 and 22 have been added. Amended claim 12 and new claim 22 are fully supported in the application as originally filed at page 19, third full paragraph. New claim 21 is supported in the application at page 8, second paragraph. No new matter has been included. The rejections over the art of record are believed untenable; accordingly, the claims should be allowed to issue.

The present invention relates to a coating composition for ink jet recording media, such as paper, where the coating composition includes a synthetic resin emulsion with a small particle size (less than 100 nm), and colloidal silica. The synthetic resin emulsion includes monomers with a six-member ring side chain moiety, monomers with silyl groups, and polymerizable surfactant. The coatings of the invention enable the production of high quality recording medium for applications such as photography image reproduction. Among various advantages, the inventive coatings have high gloss, good ink permeability, low blurring, good color development, and enable the high-speed printing of photo-quality images. Claim 1, representative of the claimed subject matter is reproduced below:

Claim 1. A coating composition for an ink jet recording medium comprising a synthetic resin emulsion having emulsion particles with a particle diameter of 100 nm or less and colloidal silica, wherein said synthetic resin emulsion is produced by emulsion-polymerizing (B) an unsaturated monomer having silyl groups and (C) an unsaturated monomer having six-membered rings as side chains in the presence of (A) an emulsifier containing a radically polymerizable emulsifier having sulfonic acids and, optionally, (D) another radically polymerizable unsaturated monomer which is copolymerizable with (B) and (C).

The Examiner rejected claims 1-7, 10-11, and 14-18 as obvious over the *Murase* document (cites to *Murase* herein are to US equivalent 6,517,941) in view of the '205 *Yoshihara* patent, reasoning that, although *Murase* does not indicate emulsion particle size, the claimed particle size would have been obvious in view of *Yoshihara* which states that the a small emulsion size imparts desirable optical properties to a coating. Claims 8, 9, 19, and 20 were rejected for similar reasons over *Murase* in view of *Yoshihara* and in further view of *Sumita* which discloses an ink jet recording medium. The Examiner's summary of the obviousness issue is reproduced below for ready reference:

> Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust the particle diameter of the synthetic resin particles in the claimed range as taught by Yoshihara in Murase's synthetic resin emulsion for coating composition because it does not adversely affect the light transmission from the viewpoint of the visual acuity of the human being and also because, when an inorganic component is grown within the synthetic resin particles, the inorganic component is not grown to an excessive size (US'205, col. 7, lines 4-13), and thus to arrive at the subject matter of instant claim 1 and dependable claims 5, 10, 14 and 15.

The above rejection is improper because there is no suggestion or motivation to make the proposed particle size modification and, in any event, the *Yoshihara* reference is not analogous art.

It is well settled that in order to form a *prima facie* case of obviousness, the prior art must suggest the desirability of the claimed invention. MPEP § 2143.01. In the present case, the art must suggest the Examiner's proposed modification, *i.e.*, it must suggest the desirability of modifying the synthetic resin particles in '533 *Murase* to have the diameter of that taught by

Yoshihara. See, In re Gordon, 221 USPQ 1125, 1127 (Fed. Cir. 1984). The relevant portion of *Yoshihara* referred to by the Examiner is reproduced below:

> The particle diameter of the synthetic resin particles in the coating according to the present invention, particularly when the formation of a transparent coating is contemplated, determines the optical properties of the coating. A proper particle diameter is selected preferably in a range of 10 µm or less. The particle diameter is particularly preferably less than the wavelength of light 0.05–0.06 µm which is in a visible light region and to which human being is highly sensitive, because it does not adversely affect the light transmission from the viewpoint of the visual acuity of the human being and also because, when an inorganic component is grown within the synthetic resin particles, the inorganic component is not grown to an excessive size.

The above passage fails to provide proper motivation to a skilled artisan because the *Yoshihara* teaching refers to an entirely different type of coating composition which is used for a different purpose and which has different, indeed somewhat incompatible, properties than are desired for the coating compositions of the invention.

First, the *Yoshihara* reference is directed to an acrylic polymer/metallic emulsion where the metallic compound is condensed within a synthetic resin, and is grown inside the resin. In contrast, the instant invention concerns a simple mixture or blend of colloidal silica and a synthetic resin emulsion with cyclic monomers, such as styrene. In the present invention, the resin emulsion has a small particle size and is stabilized with polymerizable surfactants. Further, the use of radically polymerizable surfactants having sulfonic acid moieties is necessary to achieve the desired particle size of the synthetic resin emulsion. The combination of using small particles with polymerizable surfactants allows ink permeability and acceptable gloss, without blurring or bleeding of the ink.

The suggestion to modify the '533 *Murase* reference as proposed by the Examiner is untenable because *Murase* is directed to a coating composition for paper (or like ink-jet recording medium) to promote glossiness and other properties desirable in paper coatings, while

the *Yoshihara* reference relates to coating compositions for *transparent* substrates in order to reduce reflection.

Desirable properties for ink-jet recording media, such as high gloss, are outlined in the *Murase* reference at col. 2:

> The coating composition according to the present inven-
> tion is useful for making coated paper, especially one
> required to have high gloss, high resistance to water and
> heat, and good ink penetration essential to ink-jet printing.
> Paper coated with the coating composition of the present
> invention can readily be recycled after use.

In contrast to the above, *Yoshihara* states repeatedly that the coating compositions promote anti-reflectiveness on surfaces of optical components or other transparent surfaces. Examples of substrates given in *Yoshihara* include optical lenses, camera lenses, and windows. See, *Yoshihara* at col. 1, lines 5-12. Indeed, as can be seen from *Yoshihara* at col. 7 (cited by the Examiner), *Yoshihara* teaches that coatings with emulsion particles of less than 10 micron diameter do not interfere with light *transmission, i.e.*, the coatings have low reflectivity See, also, Table 1 of *Yoshihara*.

Yoshihara would not, therefore, suggest the desirability of reducing the emulsion particle diameter in a paper coating which is designed to have high gloss, as is the case with the present invention and *Murase*. We note, in this regard, that high light transmission and high gloss are, for the most part, mutually exclusive properties; gloss on paper is directly proportional to reflectance at the specular angle. **Exhibit A**, accompanying this submission, is a standard test method (TAPPI T 480 om-05) to measure gloss on coated paper. As can be seen therein at paragraph 3.1 and Fig. 1, the gloss on paper is measured by quantifying the amount of light reflected off of the surface of a test specimen, where high reflectance indicates higher gloss. Thus, if anything, the passage cited by the Examiner would dissuade a skilled artisan from making the proposed particle size modification to paper coating compositions, particularly those designed to have high gloss. Additionally, the proposed modification of the prior art cannot

render the reference unsatisfactory for its intended purpose. MPEP § 2143.01, fifth heading. Accordingly, the Examiner's proposed modification is not suggested by the references.

Additionally, the *Yoshihara* reference is not analogous art. While *Yoshihara* is directed to coating compositions, it relates to an entirely different type of coating, used for a different purpose, and having different properties. The coatings described in *Yoshihara* are neither in the same field of endeavor as the present invention (paper coatings), nor are they pertinent to the problem at hand (improved gloss, ink permeation, etc.). The mere fact that both patents disclose coating compositions does not, *ipso facto*, make them analogous. As stated in *In re Bigio*:

> This test for analogous art requires the PTO to determine the appropriate field of endeavor by reference to explanations of the invention's subject matter in the patent application, including the embodiments, function, and structure of the claimed invention. See Wood, 599 F.2d at 1036 (confining the field of endeavor to the scope explicitly specified in the background of the invention); see also Deminski, 796 F.2d at 442 (determining that the cited references were within the same field of endeavor where they "have essentially the same function and structure").

72 USPQ2d 1209,1212 (Fed. Cir. 2004). Here, using teachings relevant to anti-reflective coatings to modify the paper coatings in *Murase* is pure hindsight.

Additional claims are believed clearly patentable over the art of record. Claim 2, for instance, recites that the coating composition has 59-98 % of cyclic moiety-containing monomers, 0.1-15 % of silyl monomers, and from 0.5-5 % of radically polymerizable surfactant. Additionally, amended claim 12 (which was rejected under §102) and new claim 22 recite that the synthetic resin has from 59-98 % of cyclic moiety monomers. As stated in the pending application at page 19, these monomers promote water resistance, anti-blocking, and color development. The '533 *Murase* reference, in contrast, describes hydrosol emulsions which have a significant predominance of straight-chained acrylic monomers and acid-monomers to promote swelling. Hydrosol resins of the type described in '533 *Murase* are specifically distinguished in the pending application at page 2:

ing the ink permeability. On the other hand, so called "hydrosol"-type emulsions with a smaller particle diameter obtained through neutralization by containing a large amount of carboxyl groups tend to, due to the high content of hydrophilic monomers, cause swelling by aqueous inks and thus lead image-blurring. In addition, said "hydrosol"-type emulsions also have a problem that desired water-resistance can be obtained only with difficulties. Further-

Consistent with the above passage, the *Murase* reference discloses synthetic emulsions having relatively large levels of acid monomers and high amounts of straight chained acrylates. It does not disclose or suggest the amount of cyclic moiety monomers recited in claims 2, 12 and 22. On this point, the Examiner concluded that the amounts of monomers in the emulsion resin are merely result effective variables. This is unsustainable. For a claimed element to be a result effective variable, the parameter at issue must first be recognized as a result effective variable in the art. See, MPEP § 2144.05(II)(B):

> **B.   *Only Result-Effective Variables Can Be Optimized***
>
> A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result- effective variable.). See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the formation of an alloy).

Here, the art of record does not recognize that the amount of monomers, particularly cyclic group-containing monomers, is a result-effective variable, and indeed appears to only mention cyclic moiety monomers as an optional component to be used, if at all, in minor amounts. See, e.g., *Murase* at col. 5, lines 16-20; *see, also,* Examples 1-8, where it is seen that

monomers with cyclic groups are used in amounts of, at most, 20 percent. Accordingly, without some teaching in the art that the amount of cyclic monomers, surfactant, and silyl groups can be merely optimized to provide for the advantages of the invention, dismissing these elements as result-effective variables is improper. Claims 2, 12 and 22 should be allowed.

New claim 21 is also believed allowable, because the art of record does not suggest the use of a styrene sulfonate compound. As stated in the pending application at p. 8, the use of a styrene sulfonate emulsifier is desirable because it enables more stable emulsions with a very small particle diameter.

Claims 8, 9, and 19-20 are directed to an ink jet recording medium having the coating composition described above. The Examiner rejected these claims over *Murase* in view of *Yoshihara* and in further view of European Patent Application EP 1 114 734 (*Sumita*), reasoning that it would be obvious to employ the coating composition disclosed in *Murase* (in view of *Yoshihara*) in the ink jet recording medium described in *Sumita*. However, as already discussed above, *Yoshihara* refers to a coating composition which *reduces* reflection, while the *Sumita* reference teaches that the ink jet recording sheet should be provided with a glossy coating. *See, e.g.*, paragraph 0410 and claim 45 of *Sumita*. Hence, as mentioned above, because *Yoshihara* teaches a coating composition with reduced gloss, the artisan has no motivation to use the coating composition discloses in *Yoshihara* for preparing the ink-jet recording medium disclosed in *Sumita*.

Further, as discussed in connection with *Murase* above, it is an important feature of the claimed coating composition that an unsaturated monomer having six-membered rings as side chains is used as the main monomer and acrylates are present in a minor amount, as embodied, for example, in claim 2. *See, also*, Table 1 of the pending application. As disclosed in paragraphs 0020 and 0026 of the pending application, using a radically polymerizable emulsifier having a sulfonic acid group is critical to obtain the desired small particle size in the synthetic resin emulsions. Hence, even the combination of *Murase* with *Sumita* does not provide any motivation to the artisan, to prepare an ink-jet recording medium using the claimed coating composition.

Additionally, *Sumita* discloses on page 14 and 15, paragraphs 0148 and 0149 various nonionic monomers, which can be optionally used in the coating composition of *Sumita*. *Sumita* mentions styrene as one possible monomer, but taking the disclosure of *Sumita* as a whole into consideration, the artisan has no motivation to select an unsaturated monomer having a six-membered ring as a side chain as the main component in the polymer in combination with a radically polymerizable emulsifier having sulfonic acids, in order to obtain the desired particle size, even if *Sumita* mentions the use of polymerizable emulsifiers in the emulsion polymerization process. In this regard, *Sumita* appears to be directed to a coating composition that is based on an acrylic copolymer with a substantial amount of a polyvinyl alcohol as a colloid stabilizer, as is seen, for example in claim 1.

All claims should be allowed, for the reasons discussed above.

This response is believed timely filed. If any additional extensions are required, please consider this paper a *Petition* thereof and charge our Deposit Account No. 50-0935. Please charge any applicable fees for additional claims to our Deposit Account no. 50-0935.

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Specular gloss of paper and paperboard at 75 degrees

1. Scope

1.1 This method is for measuring the specular gloss of paper at 75° (15° from the plane of paper). Although its chief application is to coated papers (*1*), it is also used for a variety of uncoated papers.

1.2 This method is suitable for low- to high-gloss papers. For very high-gloss papers such as cast-coated, lacquered, highly varnished (*2-4*) or waxed papers (*5*), and high-gloss ink films (*6*), TAPPI T 653 "Specular Gloss of Paper and Paperboard at 20 Degrees" is preferred. T 480 has been shown to be suitable for gloss measurements of most ink films on paper or paperboard. Differences in the color and diffuse reflectances of these ink films have a negligible effect on measured gloss. For example, when white and black surfaces which are otherwise identical are tested, the white surface will measure less than one gloss unit higher than the black.

1.3 This method does not measure image-reflecting quality.

2. Significance

This method is widely used as a partial measure of the surface quality and shiny appearance of coated paper.

3. Apparatus

3.1 *Gloss meter*[1], having the general arrangement and relative dimensions of the critical parts shown in Fig. 1. It consists of a source of light, a lens giving a converging beam of rays incident on the test specimen, a suction plate to hold the specimen flat, and a light detector to receive and measure certain rays reflected by the test specimen. These components are combined in a light-tight housing that is matte black inside and is structurally and optically stable during warming and at the operating temperature. Details of the geometric, spectral, and photometric characteristics of the instrument and of the specimen holder are given in Appendix A.

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[1]Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list in the bound set of TAPPI Test Methods, or may be available from the TAPPI Quality and Standards Department.

3.1.1   *Area of specimen illuminated.* The area illuminated is controlled by the dimensions of the aperture stop *A-A* specified in Fig. 1. If the outline of this spot is projected sharply onto the specimen, the illuminated area will be rectangular, $0.100d \pm 0.010d$ wide and $0.050d \pm 0.005d$ times $1/\cos 75°$ long. When the value for *d* is 100 mm, the illuminated spot will have a width between 9.0 and 11.0 mm, and a length between 17.4 and 21.3 mm, resulting in an illuminated area between 156 and 234 mm^2.

3.2.1   *Gloss standards*[1]. The theoretical specular-gloss standard is an ideal, completely reflecting, plane mirror having an assigned value of 384.4 gloss units. A flat, clean, and highly polished surface of black glass having a refractive index of 1.540 for the sodium D line may be shown by the Fresnel equation (7) to measure 100 gloss units on this scale.

$$R_S = 0.5 \left[\frac{sin^2(i-r)}{sin^2(i+r)} + \frac{tan^2(i-r)}{tan^2(i+r)} \right]$$

where:

i = angle of incidence (70 deg), (calculations made with angles converted to radians)

r = angle of refraction $\left(sin^{-1}\left(\frac{sin(i)}{n} \right) \right)$

and

n = refractive index

Alternatively, (R_S) may be written in the following way which is consistent with ISO 8254.

$$R_S = 100 \cdot K$$

$$K = \frac{\left(\dfrac{n^2 \cos i - (n^2 - sin^2 i)^{1/2}}{n^2 \cos i + (n^2 - sin^2 i)^{1/2}} \right)^2 + \left(\dfrac{(n^2 - sin^2 i)^{1/2} - \cos i}{(n^2 - sin^2 i)^{1/2} + \cos i} \right)^2}{\left(\dfrac{n_0^2 \cos i - (n_0^2 - sin^2 i)^{1/2}}{n_0^2 \cos i + (n_0^2 - sin^2 i)^{1/2}} \right)^2 + \left(\dfrac{(n_0^2 - sin^2 i)^{1/2} - \cos i}{(n_0^2 - sin^2 i)^{1/2} + \cos i} \right)^2}$$

where:

i = angle of incidence
n = refractive index of gloss being tested
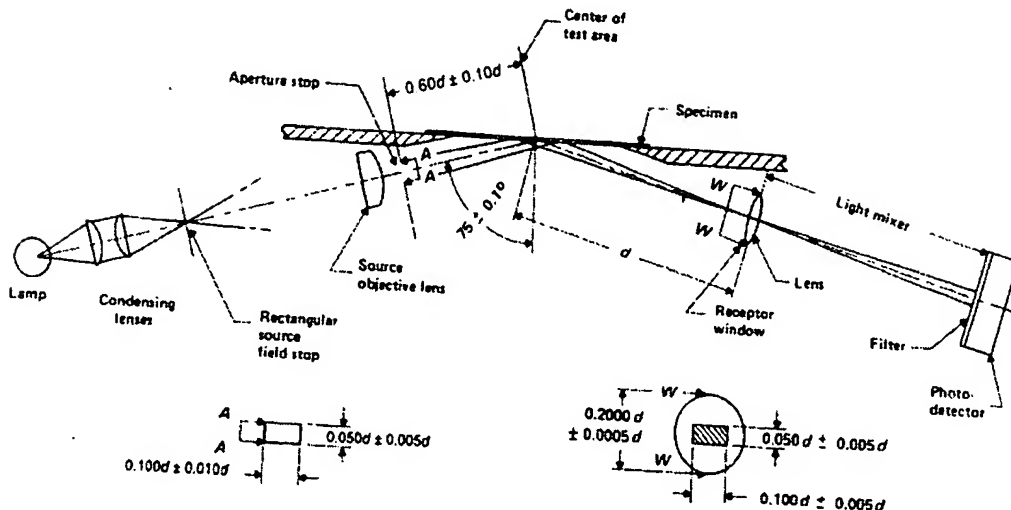n_0 = refractive index of gloss which reads 100.0 gloss units (1.540)

Fig. 1. Schematic drawing of glossmeter in which dimensions are given in terms of d, the distance between center of test area and receptor window. The cross-hatched rectangle in the W-W circle represents the image of the source field stop in the receptor window.

3.2.1   *High-gloss working standard*, a clean plaque of polished black glass for which the 75° specular reflectance has been computed from its refractive index as measured for the sodium D line.

3.2.2   *Intermediate-gloss standards*, having a reflected flux distribution comparable to that of the paper to be tested. Such standards may consist of ceramic tiles which are flat enough so that they do not rock when placed in the position of the specimen and are uniform in gloss over their central area. Each of these tiles is calibrated against the black glass standard on an instrument conforming with 3.1. For the purpose of this method, evaluated paper standards may be used for intermediate gloss verification.

NOTE 1:   Store standards in a closed container when not in use. Keep them clean and away from any dirt which might scratch or mar their surfaces. Never place standards face down on a surface which may be dirty or abrasive. Always hold standards at side edges to avoid transferring oil from one's skin to the standard surface. Clean standards in warm water and a mild detergent solution, brushing gently with a soft nylon brush. Do not use soap solutions to clean standards because they can leave a film. Rinse standards in hot running water (temperature near 150°F or 65°C) to remove detergent solution, followed by a final rinse in distilled water. Do not wipe intermediate standards. The polished black glass high-gloss standard may be dabbed gently with a lint-free paper towel or other lint-free absorbent material. Place rinsed standards in warm oven to dry.

NOTE 2:   Black glass standards may not be stable and may change a few percent over a period of several years (*8*). The refractive index or gloss value should be verified from time to time against a stable standard. Major standardizing laboratories such as the National Institute of Science & Technology (NIST), USA, or the National Research Council, Canada, are able to verify the gloss values of such black glasses.

4.   Sampling and test specimens

From each test unit obtained in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product," cut at least ten test specimens or select ten measurement areas free from folds or wrinkles or other blemishes and of sufficient size to cover completely the specimen opening of the instrument with an adequate overlap. Keep the specimens clean and do not touch the area to be tested. Condition and test the paper in an atmosphere of 50% + 5% - 10% RH and 23.0 ± 5.0°C (73.4 ± 9.0°F).

NOTE 3:　　The exposure of some papers to relative humidities of about 65% or above progressively and irreversibly decreases the gloss (9).

NOTE 4:　　Like other paper surface properties, gloss can be expected to vary from one side to the other. CD values are typically lower than MD values.

5.　Procedure

　　5.1　Follow the instrument manufacturer's instructions for warming up and calibrating the gloss meter, assuring that the standards are properly cleaned.

　　5.2　Check the zero of the instrument with the specimen aperture covered with a black velvet-lined cavity, and then remeasure the black glass and intermediate-gloss standards. [Correct readings on the black glass and intermediate-gloss standards suggest that an instrument is in approximate, but not necessarily in exact, conformance with the above apparatus specification (*10*).] When readings differ by more than 1 gloss unit from assigned values, the instrument should be checked for conformance to the geometric, spectral, and photometric requirements.

　　5.3　Following the calibration check, measure at least 5 specimens or areas with the light path parallel to the machine direction. Measure the same number of areas with the light path parallel to the cross direction. Repeat for the other side of the sample, if desired.

NOTE 5:　　If the MD values vary by more than 1.0 unit when the sample is rotated 180°, half of the MD measurements must be made in each orientation.

6.　Report

　　Report the average of the MD and CD measurements as the TAPPI 75° Gloss value for the side tested. The minimum and maximum values and other data regarding the population of test values may also be reported.

NOTE 6:　　If your purposes require MD or CD values, at least ten measurements are required in each direction of interest. These values must be reported as MD or CD, as appropriate.

7.　Precision

　　The following estimates of repeatability and reproducibility are based on data from the CTS - TAPPI Interlaboratory Program for Paper & Paperboard. The test results were taken from Reports 166 through 170 from 1997. The following statistics are based on machine direction gloss values using three test results per sample. Each test result is based on 10 determinations with two replicate measures (upstream/downstream) per determination. Labs which were excluded from the interlaboratory report or conducted testing with a non-conforming instrument were excluded from these calculations. It should be noted that repeatability conditions were not followed in that test results from each lab were not taken at one time, but were separated by several months.

GLOSS UNITS

Material	Grand Mean	Repeatability r		Reproducibility R		Labs Included
.008 CIS Cover	84.21	1.35	1.6%	2.12	2.5%	36
70# Gloss Offset	72.89	4.59	6.3%	4.87	6.7%	39
65# Gloss Offset	48.62	1.99	4.1%	3.13	6.4%	25
57# Gloss Offset	42.68	2.24	5.3%	3.02	7.1%	25
70# Dull Offset	28.63	2.12	7.4%	2.73	9.5%	30
Mean:		2.46	4.9%	3.17	6.4%	

Repeatability and reproducibility are estimates of the maximum difference (at 95%) which should be expected when comparing two test results from materials similar to those described above under similar test conditions. These estimates may not be valid for different materials or testing conditions.

These values are based on actual mill/laboratory measurements with procedures which may not conform to this method. This information is given as an estimate of the variation in 75° Gloss testing that exists across the industry.

8.   Keywords

Paper, Paperboard, Gloss

9.   Additional information

9.1   Effective date of issue: May 23, 2005.

9.2   Related methods: ANSI P3.23, T 653 "Specular Gloss of Paper and Paperboard at 20°."

Appendix A. Description of the instrument

A.1   *Optical system.* Referring to Fig. 1, beginning at the lamp, the dashed line indicates the path of the ray of light passing through the condenser lens and the geometric center of a rectangular aperture which becomes the effective source of light: through the source objective lens, through the geometric center of the rectangular aperture stop and to the specimen. This axial ray of light intersects the specimen plane at a point defined as the center of the test area. (This is not necessarily the geometric center of the illuminated area of the specimen.) With a plane front-surfaced mirror as the specimen, the axial ray is specularly reflected and passes through the center of the receptor window. The source objective lens makes an image of the source aperture at the receptor window. The distance d, from the center of the test area to the receptor window, is used as the basis from which to specify all other dimensions. The most critical dimensions are the angle of incidence, the position of the receptor window, and the diameter of the receptor window ($11,12$).

A.1.1   To achieve uniform weighting of the rays taking different paths through the receptor window, a light mixer (10) may be interposed between the receptor window and the photodetector. The positive lens is located adjacent to the receptor window and is arranged to collect all rays of light passing through the window and to form an image of the illuminated specimen surface on the photodetector sensitive surface, or on a diffusing screen immediately in front of this surface. No rays other than those reflected from the specimen surface are permitted to enter the receptor window.

A.1.2   *Angle of incidence.* The axial ray intersects the specimen plane at an angle of $75.0 \pm 0.1°$.

A.1.3   *Receptor window.* The diameter of the receptor window is expressed in terms of the distance d, from the center of the test area to the entrance plane of the receptor window and is $0.2000d \pm 0.0005d$ and the thickness of its edge is not to exceed $0.005d$. The axial ray, when reflected from a plane front-surface mirror in the specimen position, passes through the center of the receptor window within $0.0004d$ and is perpendicular to the plane of the receptor window.

A.1.4   *Position and size of light source aperture.* The position of the image of the light source aperture is in the plane of the receptor window with a tolerance, along the direction of the axial ray, of $\pm 0.04d$. The size of the rectangular image is $0.100d \pm 0.005d$ by $0.050d \pm 0.005d$, the short dimension of the rectangle lying in the plane of incidence (i.e., containing the incident and the specularly reflected axial ray).

A.1.5   *Position and size of the aperture stop.* The rectangular aperture stop is located $0.60d \pm 0.10d$ from the center of the test area with its plane perpendicular to the axial ray. The size of the stop is $0.100d \pm 0.010d$ by $0.050d \pm 0.005d$, the short dimension being in the plane of incidence. No other stops or diaphragms are permitted to intercept the incident rays of light.

A.1.6   *Spectral conditions.* The lamp, lenses, and photodetector shall be spectrally corrected to give a spectral response duplicating the CIE luminous efficiency function (Y_A), which has an effective wavelength of 572 nm.

A.1.7   *Light detector.* Any combination of photodetector and indicating device may be used, provided it indicates the true light flux to within ± 0.2 units over the entire 100-unit scale. The photometric linearity may be established by using the procedure described by Höfert and Loof (13).

A.1.8   *Specimen holder.* The suction plate for holding the specimens is firmly mounted and sufficiently flat so that the image in the receptor window of a thin, flexible plastic film of uniform thickness (for example, 0.003-in. thick, optical grade Mylar) held by this suction plate, will not be measurably different in position and size from that of the image formed by the black glass standard as described earlier. Suction plates may be made from a solid plate which

contains two shallow grooves (or a single circular groove) on the side of the plate against which the specimen is held. The connection for supplying vacuum to the grooves may be made by drilling holes through the plate into each groove. Solid flat plates of brass or steel are suitable for making this type of suction plate.

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Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Director of Quality and Standards. ∎